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| 10/812,974      | 03/31/2004  | Masanori Kadotani    | 520.42565CX1        | 5958             |

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EXAMINER

HASSANZADEH, PARVIZ

ART UNIT PAPER NUMBER

1763

DATE MAILED: 09/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/812,974

Applicant(s)

KADOTANI ET AL.

Examiner

Parviz Hassanzadeh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 3/31/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Specification***

The disclosure is objected to because of the following informalities:

on page 3, line 13, it is suggested to insert the prior art 5.

Appropriate correction is required.

### ***Information Disclosure Statement***

The listing of references (*prior arts 5 and 6*) in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

### ***Drawings***

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "11A, 11, 11B and 12B" in Fig. 2A have been used to designate inner and outer coolant channels inconsistent with those shown in Fig. 3A. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required

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corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Claims 1, 4, 6, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda (JP 9-17770-A) in view of Arasawa et al (US Patent No. Re. 36810).**

Fukuda teaches a plasma processing apparatus and a method of using the same, the apparatus including a stage 9 disposed in a processing chamber (Fig. 1) for supporting a wafer W, the stage 9 comprising:

a first refrigerant flow passages 11, 14 formed inside the stage 9, a refrigerant at a relatively low temperature is supplied to the outside passage 11 and a refrigerant at relatively high temperature is supplied to the inside passage 14 such that a uniform temperature distribution is realized on the surface of the stage (temperature control means) (abstract and paragraphs 0026-0029); and

a temperature control gas supply line 125, 26 as shown in Fig. 3 (gas supply means) coupled to pressure gauges 28, 27, respectively, for controlling pressure of gas in the central and peripheral portion of the gap defined between the wafer and the stage (paragraphs 0035-0043).

*Further regarding coolant temperature difference:* the outside and inside refrigerant flow passages 11, 14 are provide with coolant having different temperatures such that a uniform temperature across the surface of the stage is maintained (abstract, paragraph 0028).

Fukuda teaches the heat conducting gas having pressure difference at the central and the peripheral portion of the wafer. However, Fukuda fails teach a controller for adjusting the gas flow rate in different gas channels allowing adjustment of the pressure difference and temperature difference during processing.

Arasawa et al teach a plasma processing apparatus (Fig. 6) and a method of using the same, the apparatus including a susceptor 14 disposed inside a process chamber 11, wherein the susceptor 14 comprising coolant passage 15, heat transfer passages connected to 25a, 26a, and a controller 30 for controlling various functions associated with the susceptor including gas supply sources providing independent gas flows at the central and peripheral portions of the space defined between a wafer and the upper surface of the susceptor, wherein the temperature distribution as shown in Figs. 10, 11 are affected by the changes in the pressure of the gas at central and peripheral areas controlled through a controller 30 (column 4, line 4 through column 6, line 52).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the controller as taught by Arasawa et al in the apparatus of Fukuda in

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order to control the gas pressure at central and the peripheral portion of the wafer stage which in turn would affect the temperature distribution across the surface of the wafer stage.

*Further regarding the pressure difference of the heat conducting gas is adjusted to a small value at the initial stage and the post stage of the processing:* Arasawa et al teach (Fig. 9) that the gas back pressure difference is controlled during the processing step S6 when the wafer is heated during the step of plasma processing. By adjusting the pressure difference at the peripheral, middle and central portions of the wafer a uniform temperature is maintained across the surface of the wafer. It would have been obvious to one of ordinary skill in the art at the time of the invention not to apply different pressures at the different portions of the wafer at the initial stage S2 when the wafer disposed on the susceptor is cooled and at the end of the plasma processing S9 when the wafer is no longer subject the heat associated with the plasma processing.

**Claims 2, 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda (JP 9-17770-A) in view of Arasawa et al (US Patent No. Re. 36810) and Sugano et al (JP 2000-216140-A).**

Fukuda in view of Arasawa et al teach all limitations of the claims as discussed above except for the temperature difference of the coolant is changed to be increased at the initial stage and the post stage of the processing.

Sugano et al teach a wafer stage (Fig. 1) including coolant passages 20, 21 formed within the stage connected to independently controlled refrigerant such that by adjusting the corresponding controlled valves the temperature distribution across the surface of the stage can be controlled at high response performance (abstract, paragraphs 0019-0029).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the refrigerant control mechanism as taught by Sugano et al in the apparatus of Fukuda in view of Arasawa et al in order to control the temperature distribution across the surface of the stage at high performance. Further, increasing the temperature difference of the coolant at the initial stage and at the post stage of the plasma processing is considered an optimization process that would have been obvious to one of ordinary skill in the art in order to maintain a uniform temperature across the wafer.

**Claims 3, 5, 8, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda (JP 9-17770-A) in view of Arasawa et al (US Patent No. Re. 36810) as applied to claims 1, 4, 6, 9, and further in view of Sugano et al (JP 2000-216140-A) and Lue et al (US Patent No. 5,761,023).**

Fukuda in view of Arasawa et al teach all limitations of the claims as discussed above except for the temperature difference of the coolant and the pressure difference of the heat conducting gas are adjusted on the basis of information obtained in advance before the processing of the wafer is started.

Sugano et al teach a wafer stage (Fig. 1) including coolant passages 20, 21 formed within the stage connected to independently controlled refrigerant such that by adjusting the corresponding controlled valves the temperature distribution across the surface of the stage can be controlled at high response performance (abstract, paragraphs 0019-0029).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the refrigerant control mechanism as taught by Sugano et al in the

apparatus of Fukuda in view of Arasawa et al in order to control the temperature distribution across the surface of the stage at high performance.

Fukuda in view of Arasawa et al and Sugano et al fail to teach a controller controlling the cooling system and the pressure control device based on stored data in a memory.

Lue et al teach a plasma processing apparatus (Fig. 1) including a controller 39 for controlling the apparatus including helium supply 53 and heat exchange 33 and wherein the controller 39 is in communication with a memory 45 having a program stored therein for operating the apparatus.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the controller as taught by Lue et al in the apparatus of Fukuda in view of Arasawa et al and Sugano et al in order to control the operation of the entire apparatus including the coolant mechanism wherein the entire system can be operated using a program and instructions stored in the memory (column 5, line 51 through column 6, line 2).

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Arai et al (US Patent No. 6,664,738 B2) teach a wafer stage including independently controlled coolant passages (Fig. 3) formed therein such that the temperature across the surface of the stage can be controlled.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Parviz Hassanzadeh whose telephone number is (571)272-1435. The examiner can normally be reached on Tuesday-Friday.



If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (571)272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*P. Hassanzadeh*  
Parviz Hassanzadeh  
Primary Examiner  
Art Unit 1763

September 15, 2004